We claim:

1. An abrasive slurry composition for the chemical-mechanical polishing of a polysilicon layer formed over structures including silicon nitride comprising:

a carrier liquid;

abrasive particles; and

a non-ionic surfactant that selectively forms a passivation layer on exposed surfaces of the polysilicon layer.

2. An abrasive slurry composition according to claim 1, further comprising:

a second surfactant, the second surfactant selectively forming a second passivation layer that will reduce a removal rate of silicon nitride or silicon oxide during the chemical-mechanical polishing

3. An abrasive slurry composition according to claim 1, wherein:

abrasive slurry includes a pH controller selected from the group consisting of KOH, NH_4OH, TMA, TMAH and TEA for maintaining a target slurry pH;

the target slurry pH is between about 7 and 12;

the non-ionic surfactant includes at least one compound selected from a group consisting of

ethylene oxide-propylene oxide block copolymer alcohols and ethylene oxide-propylene oxide tri-block polymers.

4. An abrasive slurry composition according to claim 3, wherein:

the ethylene oxide-propylene oxide block copolymer alcohols are selected from a group consisting of a first group of alcohols represented by the formula I

$$CH_3-(CH_2)_n-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \qquad (I)$$

wherein

n is an integer satisfying the relationship $3 \leq n \leq 22$;

y is an integer satisfying the relationship $1 \leq y \leq 30$; and

x is an integer satisfying the relationship $1 \leq x \leq 30$;

and a second group of alcohols represented by the formula II

$$R_2-C_6H_4O-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \qquad (II)$$

wherein

R_2 is $-C_9H_{19}$ or $-C_8H_{17}$.

5. An abrasive slurry composition according to claim 3, wherein:

the ethylene oxide-propylene oxide tri-block polymers are selected from a group consisting of a first group of polymers represented by the formula III

$$(CH_2CH_2O)_z-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \qquad (III)$$

and a second group of polymers represented by the formula IV

$$(CH(CH_3)CH_2O)_z-(CH_2CH_2O)_y-(CH(CH_3)CH_2O)_x-OH \qquad (IV)$$

wherein

z is an integer satisfying the relationship $1 \leq z \leq 30$.

6. An abrasive slurry composition according to claim 5, wherein:

z is an integer satisfying the relationship $5 \leq z \leq 30$.

y is an integer satisfying the relationship $5 \leq y \leq 30$; and

x is an integer satisfying the relationship $5 \leq x \leq 30$;

7. An abrasive slurry composition according to claim 6, wherein:

the relationship $20 \leq z + y + x \leq 70$ is satisfied.

8. An abrasive slurry composition according to claim 5, wherein:

z is an integer satisfying the relationship $10 \leq z \leq 30$.

y is an integer satisfying the relationship $10 \leq y \leq 30$; and

x is an integer satisfying the relationship $10 \leq x \leq 30$;

9. An abrasive slurry composition according to claim 5, wherein:

the abrasive particles are silica, have an average size of less than about 1 μm and are about 5 to 30 wt% of the slurry composition;

the target slurry pH is between about 8 and 12; and

the non-ionic surfactant is at least 0.001 wt% of the abrasive slurry composition.

10. An abrasive slurry composition according to claim 5, wherein:

the abrasive particles are silica, have an average size of less than about 100 nm and are about 10 to 20 wt% of the slurry composition;

the target slurry pH is between about 10 and 11; and

the non-ionic surfactant is between about 0.005 and 0.1 wt% of the abrasive slurry composition.

11. An abrasive slurry composition according to claim 2, wherein:

the abrasive particles are silica, have an average size of less than about 1 μm and are about 5 to 30 wt% of the slurry composition;

the target slurry pH is between about 7 and 12;

the non-ionic surfactant is at least about 0.001 wt% of the abrasive slurry composition; and

the second surfactant includes an imine or amine compound and is between about 0.001 and 10 wt% of the abrasive slurry composition.

12. A method of removing an upper portion of a polysilicon layer formed over a pattern including a stopping layer comprising:

polishing the polysilicon layer with an abrasive slurry to remove the upper portion of the polysilicon layer and form a polished polysilicon surface and expose an upper surface of the stopping layer, the polished polysilicon surface and the exposed surface of the stopping layer being substantially coplanar, wherein

the abrasive slurry includes a non-ionic surfactant that selectively forms a passivation layer on the polysilicon layer.

13. A method of removing an upper portion of a polysilicon layer formed over silicon nitride and silicon dioxide structures from a major surface of a substrate comprising:

applying an abrasive slurry to a polishing surface of a polishing pad, the abrasive slurry having a target slurry pH;

causing relative motion between the substrate and the polishing pad in a plane generally parallel to the major surface of the substrate while applying a force tending to bring the major surface and the polishing surface into contact;

polishing the major surface of the substrate with the abrasive slurry to remove the upper portion of the polysilicon layer from the major surface of the substrate to form a polished polysilicon surface, expose a surface of the silicon nitride structure and expose a surface of the silicon dioxide structure, the polished polysilicon surface and the exposed surface of the silicon nitride structure being substantially coplanar, wherein

the abrasive slurry includes a non-ionic surfactant that selectively forms a passivation layer on the polysilicon layer.

14. A method of partially removing a polysilicon layer according to claim 13, wherein:

the non-ionic surfactant includes one or more surfactants is selected from the group consisting of

ethylene oxide-propylene oxide block copolymer alcohols represented by the formula I

$$CH_3-(CH_2)_n-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \qquad (I);$$

ethylene oxide-propylene oxide block copolymer aryl alcohols represented by the formula II

$$R_2—C_6H_4O—(CH(CH_3)CH_2O)_y—(CH_2CH_2O)_x—OH \qquad (II)$$

wherein

R_2 is $-C_9H_{19}$ or $-C_8H_{17}$;

ethylene oxide-propylene oxide-ethylene oxide tri-block polymers represented by the formula III

$$(CH_2CH_2O)_z—(CH(CH_3)CH_2O)_y—(CH_2CH_2O)_x—OH \qquad (III);$$

and

propylene oxide-ethylene oxide-propylene oxide tri-block polymers represented by the formula IV

$$(CH(CH_3)CH_2O)_z—(CH_2CH_2O)_y—(CH(CH_3)CH_2O)_x—OH \qquad (IV);$$

wherein

n is an integer satisfying the relationship $3 \leq n \leq 22$;

z is an integer satisfying the relationship $1 \leq z \leq 30$

y is an integer satisfying the relationship $1 \leq y \leq 30$; and

x is an integer satisfying the relationship $1 \leq x \leq 30$.

15. An abrasive slurry composition according to claim 14, wherein:

z is an integer satisfying the relationship $5 \leq z \leq 30$.

y is an integer satisfying the relationship $5 \leq y \leq 30$; and

x is an integer satisfying the relationship $5 \leq x \leq 30$;

16. An abrasive slurry composition according to claim 14, wherein:

the relationship $20 \leq z + y + x \leq 70$ is satisfied.

17. An abrasive slurry composition according to claim 14, wherein:

z is an integer satisfying the relationship $10 \leq z \leq 30$.

y is an integer satisfying the relationship $10 \leq y \leq 30$; and

x is an integer satisfying the relationship $10 \leq x \leq 30$;

18. A method of partially removing a polysilicon layer according to claim 14, wherein:

the non-ionic surfactant is at least 0.001 wt% of the abrasive slurry.

19. A method of partially removing a polysilicon layer according to claim 18, wherein:

the abrasive slurry has a slurry pH of between about 7 and 12.

20. A method of partially removing a polysilicon layer according to claim 19, wherein:

the abrasive slurry has a slurry pH of between about 10 and 11.

21. A method of partially removing a polysilicon layer according to claim 18, wherein:

the abrasive slurry includes a second surfactant, the second surfactant selectively forming a second passivation layer on the surface of the silicon nitride structure, thereby

altering a removal rate of silicon nitride relative to removal rates of silicon oxide and polysilicon during the polishing.

22. A method of partially removing a polysilicon layer according to claim 21, wherein:

the second surfactant includes an imine or amine compound and is present at a concentration of between about 0.001 and 10 wt% of the abrasive slurry composition.

23. A method of partially removing a polysilicon layer according to claim 13, wherein:

the polished polysilicon surface is on average less than 50 Å from a plane defined by the exposed stopping layer surface adjacent the polished polysilicon surface.

24. A method of partially removing a polysilicon layer according to claim 13, wherein:

the polished polysilicon surface is on average less than 25 Å from a plane defined by the exposed stopping layer surface adjacent the polished polysilicon surface.

25. A method of partially removing a polysilicon layer formed over silicon nitride structures from a major surface of a substrate comprising:

applying a first abrasive slurry to a polishing surface of a polishing pad, the first abrasive slurry having a first target slurry pH;

causing relative motion between the substrate and the polishing pad in a plane generally parallel to the major surface of the substrate while applying a force tending to bring the major surface and the polishing surface into contact;

polishing the major surface of the substrate with the first abrasive slurry to remove a first portion of the polysilicon layer from the major surface of the substrate to form an intermediate polished polysilicon surface;

applying a second abrasive slurry to the polishing surface of the polishing pad, the second abrasive slurry having a second slurry pH of at least 7;

causing relative motion between the substrate and the polishing pad in a plane generally parallel to the major surface of the substrate while applying a force tending to bring the major surface and the polishing surface into contact;

polishing the major surface of the substrate with the second abrasive slurry to remove a second portion of the polysilicon layer from the major surface of the substrate to form a final polished polysilicon surface and expose a surface of the silicon nitride structure, the final polished polysilicon surface and the exposed surface of the silicon nitride being substantially coplanar, wherein

the first abrasive slurry is substantially free of all surfactants that will selectively form a passivation layer on the polysilicon layer and the second abrasive slurry includes a non-ionic surfactant that will selectively form a passivation layer on the polysilicon layer.

26. A method of partially removing a polysilicon layer according to claim 25, wherein:

the second abrasive slurry is formed by introducing at least about 0.001 wt% of the non-ionic surfactant into the first abrasive slurry.

27. A method of partially removing a polysilicon layer according to claim 25, wherein:

the non-ionic surfactant is combined with the first abrasive slurry to form the second abrasive slurry before the second abrasive slurry is applied to the polishing surface.

28. A method of partially removing a polysilicon layer according to claim 25, wherein:

the non-ionic surfactant includes one or more surfactants is selected from the group consisting of

ethylene oxide-propylene oxide block copolymer alcohols represented by the formula I

$$CH_3-(CH_2)_n-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \quad (I);$$

ethylene oxide-propylene oxide block copolymer aryl alcohols represented by the formula II

$$R_2-C_6H_4O-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \quad (II)$$

wherein

R_2 is $-C_9H_{19}$ or $-C_8H_{17}$;

ethylene oxide-propylene oxide-ethylene oxide tri-block polymer alcohols represented by the formula III

$$(CH_2CH_2O)_z-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \quad (III);$$

and

propylene oxide-ethylene oxide-propylene oxide tri-block polymer alcohols represented by the formula IV

$$(CH(CH_3)CH_2O)_z-(CH_2CH_2O)_y-(CH(CH_3)CH_2O)_x-OH \quad (IV);$$

wherein

n is an integer satisfying the relationship $3 \leq n \leq 22$;

z is an integer satisfying the relationship $1 \leq z \leq 30$

y is an integer satisfying the relationship $1 \leq y \leq 30$; and

x is an integer satisfying the relationship $1 \leq x \leq 30$.

29. An abrasive slurry composition according to claim 28, wherein:

z is an integer satisfying the relationship $5 \leq z \leq 30$.

y is an integer satisfying the relationship $5 \leq y \leq 30$; and

x is an integer satisfying the relationship $5 \leq x \leq 30$;

30. An abrasive slurry composition according to claim 28, wherein:

the relationship $20 \leq z + y + x \leq 70$ is satisfied.

31. An abrasive slurry composition according to claim 28, wherein:

z is an integer satisfying the relationship $10 \leq z \leq 30$.

y is an integer satisfying the relationship $10 \leq y \leq 30$; and

x is an integer satisfying the relationship $10 \leq x \leq 30$;

32. A method of manufacturing a semiconductor device comprising:

forming a conductive pattern;

forming insulating spacers from an insulating material, the insulating spacers encompassing the conductive pattern to form a protected pattern;

depositing a polysilicon layer on insulating spacers;

removing an upper portion of the polysilicon layer using chemical-mechanical polishing with an abrasive slurry to expose an upper surface of the insulating spacers and form a polished polysilicon surface;

depositing an interlevel oxide (ILO); and

forming contact openings in the interlevel oxide to expose portions of the polished polysilicon surface;

wherein the abrasive slurry includes one or more polymeric surfactants that form a passivation layer on the polysilicon, the surfactants being selected from the group consisting of

ethylene oxide-propylene oxide block copolymer alcohols represented by the formula I

$$CH_3-(CH_2)_n-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \qquad (I);$$

ethylene oxide-propylene oxide block copolymer aryl alcohols represented by the formula II

$$R_2-C_6H_4O-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \qquad (II)$$

wherein

R_2 is $-C_9H_{19}$ or $-C_8H_{17}$;

ethylene oxide-propylene oxide-ethylene oxide tri-block polymer alcohols represented by the formula III

$$(CH_2CH_2O)_z-(CH(CH_3)CH_2O)_y-(CH_2CH_2O)_x-OH \qquad (III);$$

and

propylene oxide-ethylene oxide-propylene oxide tri-block polymer alcohols represented by the formula IV

$$(CH(CH_3)CH_2O)_z—(CH_2CH_2O)_y—(CH(CH_3)CH_2O)_x–OH \qquad (IV);$$

wherein

n is an integer satisfying the relationship $3 \leq n \leq 22$;

z is an integer satisfying the relationship $1 \leq z \leq 30$

y is an integer satisfying the relationship $1 \leq y \leq 30$; and

x is an integer satisfying the relationship $1 \leq x \leq 30$;

whereby a selectivity ratio between a polysilicon removal rate and an insulator removal rate is reduced by at least about 50% by the formation of the passivation layer.

33. A method of manufacturing a semiconductor device according to claim 32, wherein:

the insulating material includes at least one material selected from a group consisting of silicon nitride, silicon oxide and silicon oxynitride.

34. A method of manufacturing a semiconductor device according to claim 32, wherein:

the polished polysilicon surface is on average less than 50 Å from a plane defined by the exposed upper surfaces of adjacent insulating spacers.

35. A method of manufacturing a semiconductor device according to claim 32, wherein:

the polished polysilicon surface is on average less than 25 Å from a plane defined by the exposed upper surfaces of adjacent insulating spacers

36. A method of manufacturing a semiconductor device according to claim 32, wherein:

the abrasive slurry includes a first slurry that is substantially free of polymeric surfactants capable of forming the passivation layer on the exposed polysilicon surface, the first slurry being utilized during the removal of a first portion of the polysilicon layer; and

a second slurry that includes a quantity of one or more of the polymeric surfactants capable of forming the passivation layer on the exposed polysilicon surface, the second slurry being utilized during the removal of a second portion of the polysilicon layer sufficient to expose the upper surfaces of the insulating spacers.

37. A method of manufacturing a semiconductor device according to claim 36, wherein:

a total quantity of the one or more polymeric surfactants is between about 0.005 and about 0.2 wt% of the second abrasive slurry.

38. A method of manufacturing a semiconductor device according to claim 36, wherein:

a total quantity of the one or more polymeric surfactants is between about 0.005 and about 0.02 wt% of the second abrasive slurry.